S.No. 361 $\boxed{\textbf{17PMA03}}$

(For the candidates admitted from 2017 – 2018 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2017.

First Semester

Mathematics

MECHANICS

Time : Three hours   Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL the questions.

1.   Define Virtual displacement.

2.   Define angular momentum.

3.   Write down the Lagrange's equation for a holonomic system.

4.   Define ignorable coordinates.

5.   State Modified Hamilton's principle.

6.   Write down the Euler–Lagrange equation.

7. Write down the Jacobi form of the principle of least action.

8. Write down Hamilton–Jacobi equation.

9. State Poisson's theorem.

10. Define homogeneous canonical transformation.

PART B — (5 × 5 = 25 marks)

Answer ALL the questions.

11. (a) Discuss D'Alembert's principle.

    Or

    (b) Prove that with usual notations $T_{rot} = \frac{1}{2}\omega^T I\omega$.

12. (a) Discuss the integrals of motion.

    Or

    (b) Discuss the kepler problem using ignorable coordinates.

13. (a) Find the stationary values of the function $f = z$, subject to the constraints $\phi_1 = x^2 + y^2 + z^2 - 4 = 0$, $\phi_2 = xy - 1 = 0$.

    Or

    (b) Discuss Geodesic problem.

14. (a) Derive Hamilton's principal function.

    Or

    (b) Derive Modified Hamilton–Jacobi equation.

15. (a) Discuss Poisson brackets.

    Or

    (b) Show that $Q = \sqrt{2qe^t}\cos p$, $P = \sqrt{2qe^{-t}}\sin p$ is canonical.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. State and prove Konig's theorem.

17. Derive the standard form of Lagrange's equation for a Nonholonomic system.

18. State and prove principle of least action.

19. State and prove Stackel's theorem.

20. Consider the transformation $Q = q - tp + \frac{1}{2}gt^2$, $P = p - gt$. Find K–H and the generating functions.

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